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NWC TP 5715

Benson Incident: Comparison of Burn Patterns of Boxcar Damaged in the Incident and an Experimentally Burned Boxcar

by

W. S. McEwan

Research Department

Prepared for:

Naval Sea Systems Command

NAVSEA 04H3

Washington, D.C. 20362

and

Department of Justice

Eastern District of California

Room 2058, Federal Building

650 Capitol Mall

Sacramento, California 95814

JANUARY 1976

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R. G. Freeman, III, RAdm., USN Commander

G. L. Hollingsworth Technical Director

FOREWORD

The study and experiments described in this report were performed at the request of the Office of the Judge Advocate General of the Department of the Navy (NAVJAG 148.1C) to probe the nature of ignition and spread of fire in ordnance-loaded boxcars. The study was made under Naval Sea Systems Command Task Assignment N00024-75-WR-51435 after the burning and explosion of a Southern Pacific Transportation Company train near Benson, Ariz., in May 1973.

The guidance and cooperation of Capt. M. Lechleiter, USN (then of ORD-00N), and Capt. J. Edmundsen, USN (then of ORD-04M), during the initial stages of the study are especially acknowledged.

W. S. McEwan, T. B. Joyner, and J. M. Pakulak of the Naval Weapons Center performed and witnessed the firing and photographing of the floor and wall of the experimental boxcar used in this study, and on 4 September 1974 issued a statement of concurrence with the conclusions presented in this report.

Released by
W. S. McEWAN, *Head*
Chemistry Division
23 June 1975

Under authority of
H. W. HUNTER, *Head*
Research Department

NWC Technical Publication 5715

Published by Technical Information Department
Collation Cover, 8 leaves
First printing 80 unnumbered copies

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NWC TP 5715	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) BENSON INCIDENT: COMPARISON OF BURN PATTERNS OF BOXCAR DAMAGED IN THE INCIDENT AND AN EXPERIMEN- TALLY BURNED BOXCAR		5. TYPE OF REPORT & PERIOD COVERED FINAL
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) W. S. McEwan		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Weapons Center China Lake, CA 93555		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NAVSEASYS COM Task Assignment N00024-75-WR-51435
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Weapons Center China Lake, CA 93555		12. REPORT DATE January 1976
		13. NUMBER OF PAGES 14
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Burn Patterns Train Accidents Ordnance-Loaded Boxcars		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) See back of form.		

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(U) *Benson Incident: Comparison of Burn Patterns of Boxcar Damaged in the Incident and an Experimentally Burned Boxcar*, by W. S. McEwan. China Lake, Calif., Naval Weapons Center, January 1976. 14 pp. (NWC TP 5715, publication UNCLASSIFIED).

(U) On 24 May 1973 near Benson, Ariz., a Southern Pacific Transportation Company train experienced a series of disruptive incidents leading to burning and explosion. A series of experiments at the Naval Weapons Center, China Lake, probed the nature of ignition and spread of fire in ordnance-loaded boxcars. These studies culminated in the full-scale burning of a boxcar loaded with inert bombs on wooden pallets. Photographs of debris from the NWC tests and the reconstructed boxcar from the Benson incident are compared and similarities in burn patterns are pointed out in this report, which was prepared on behalf of the Office of the Judge Advocate General of the Department of the Navy and the United States Department of Justice in preparation of the defense of the litigation arising out of the Benson incident. Conclusions as to the point of initiation and direction of propagation burning of the Benson incident fire are made.

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INTRODUCTION

On 24 May 1973, near Benson, Ariz., a Southern Pacific Transportation Company train traveling west after crossing the Continental Divide experienced a series of disruptive incidents leading to its burning and explosion. Preliminary violent events scattered debris, including charred fragments of a boxcar, along the right-of-way for a distance of approximately 4 miles. These fragments were collected and later reassembled at the Naval Ordnance Station, Indian Head, Md., for further study by representatives of the Federal Railroad Administration, the National Transportation Safety Board, and the Forest Products Laboratory. A series of experiments at the Naval Weapons Center, China Lake, probed the nature of ignition and spread of fire in ordnance-loaded boxcars. These studies (to be detailed in separate reports) culminated in the full-scale burning of a boxcar loaded with inert bombs on wooden pallets. Photographs of debris from the NWC tests and the reconstructed boxcar from the Benson incident are compared and similarities in burn patterns are pointed out in this report, which was prepared on behalf of the Office of the Judge Advocate General of the Department of the Navy and the United States Department of Justice in preparation of the defense of the litigation arising out of the Benson incident. Conclusions as to the point of initiation and direction of propagation burning of the Benson incident fire are made.

COMPARISON OF PHOTOGRAPHS OF RECONSTRUCTED BOXCAR FROM
BENSON INCIDENT AND EXPERIMENTALLY BURNED BOXCAR

Figures 1 through 5 are photographs of the reconstructed boxcar from the Benson incident taken by the author while the boxcar was at the Naval Ordnance Station, Indian Head, Md. Figures 1A through 5A are comparable photographs of the experimentally burned boxcar loaded with Mk 82 bombs on Air Force wooden pallets taken by the author from camera angles similar to those used in photographing the reconstructed Benson incident boxcar. The following paragraphs compare the burn patterns shown in the two sets of photographs.

FIGURES 1 AND 1A

Figures 1 and 1A compare the top surface of the floor of the boxcars. Note that the general wide area of burn is not very deep, except along the "penetration" crack marked (a) in Figure 1A and that along this crack the burn extends laterally to the outside end of the floor-board marked (b). This is also the case near the end of Board 2 and

Board 1 in Figure 1. The unburned bands running across the floorboards show in both Figures 1A and 1 that the floor was protected by the wooden pallet resting on the floor.

FIGURES 2 AND 2A

Figures 2 and 2A compare the bottom side (underside) of the floorboards. Notice the much more deeply reticulated "crosshatched" surface that the burn has developed here in both cases. The cross bands were made by the metal frame members on which the floor rests. In Figure 2 the square edge was caused by the explosion breaking the boards along the metal edge. That the center of the source flame was at the top of Board 1 shown in Figure 2 can be seen from the way the reticulations on Board 1 taper off from top to bottom along where the board rested on the cross member until there are none at all on the bottom side of Board 5. This shows that the initiating fire was intense but localized somewhere near (probably within a board or two) the top of Board 1 and that this side of the board (underside) had been exposed to the fire for a longer time than the topside seen in Figure 1.

FIGURES 3 AND 3A

Figures 3 and 3A also compare the bottom side of the floorboards. Boards 2 and 3 are of particular interest here. Note in Figure 3A how the metal longitudinal frame member has protected to a large extent the wood to the left of it, even though the area of complete penetration is just to the right of it, and that the scorched arc marked (c) in Figure 3A centers on the penetration crack and hole. Note the similar arc on Board 2 in Figure 3. This would indicate a source of the fire between Boards 2 and 1 and between the two metal longitudinal frame members.

FIGURES 4 AND 4A

Figures 4 and 4A present another view of the same boards seen in Figures 3 and 3A. The underside area of the reconstructed boxcar (Figure 4) which would correspond to the heavily charred area along the left side of Figure 4A was apparently blown away in the form of very small pieces which were never recovered.

FIGURES 5 AND 5A

Figures 5 and 5A show the walls in the vicinity of the fire inside the car surfaces. Figure 5A shows the end of the experimental car, whereas Figure 5 shows the side of the reconstructed car. It should be noted that the charring seen in Figure 5A has been caused by the secondary burning and directing of the flames by the wooden pallets since the floor area inside (see Figure 1A) is not much affected and the side wall shown in Figure 5 is even less affected.

CONCLUSIONS

Similar markings of charring and damage in the two series of photographs show without a doubt the direction of the burning, the degree of damage (when allowance is made for the fact that the experimental burning (A series) was not allowed to go through to explosion), and that the pallet marks are similar in the two series.

Since it is known that the fire in the experimental boxcar started on the *outside* bottom of the car, it can be considered established that the fire initiating the Benson incident also started from outside the car.



FIGURE 1. Burn Pattern of Top Surface of Floorboards of Reconstructed Boxcar.



FIGURE 1A. Burn Pattern of Top Surface of Floorboards of Experimental Boxcar.

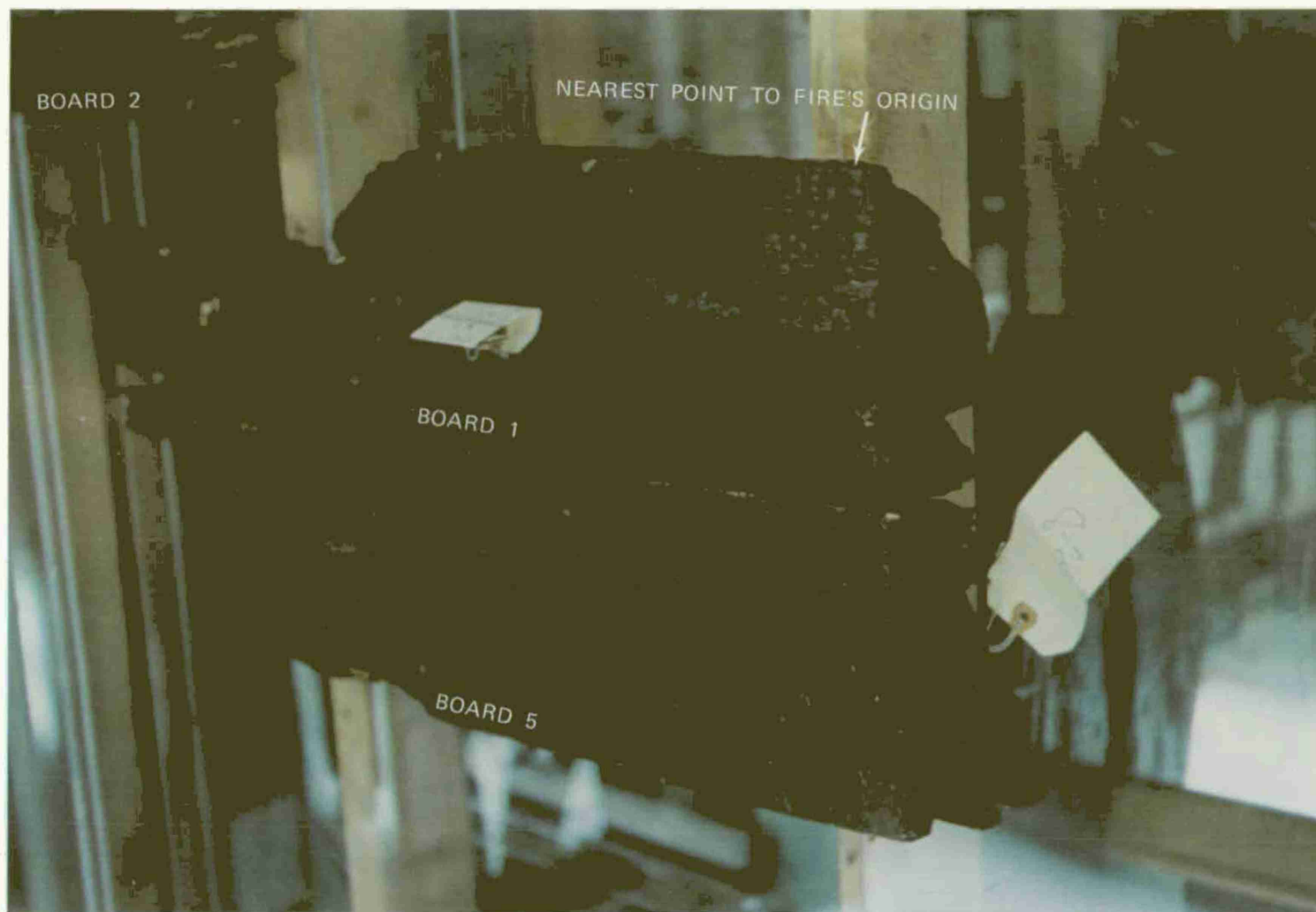


FIGURE 2. Burn Pattern of Bottom Side of Floorboards of Reconstructed Boxcar.



FIGURE 2A. Burn Pattern of Bottom Side of Floorboards of Experimental Boxcar.

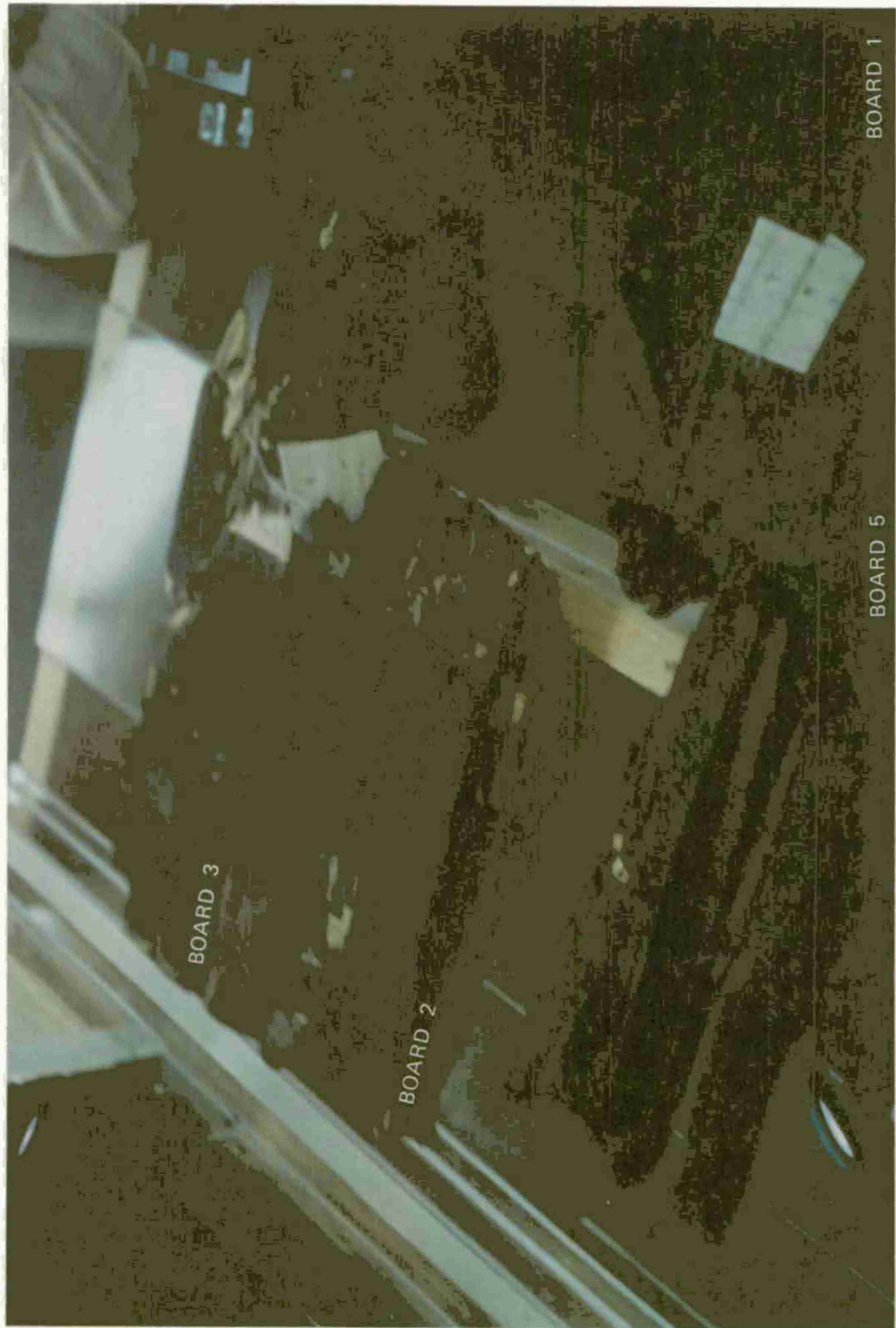


FIGURE 3. Burn Pattern of Bottom Side of Floorboards of Reconstructed Boxcar.

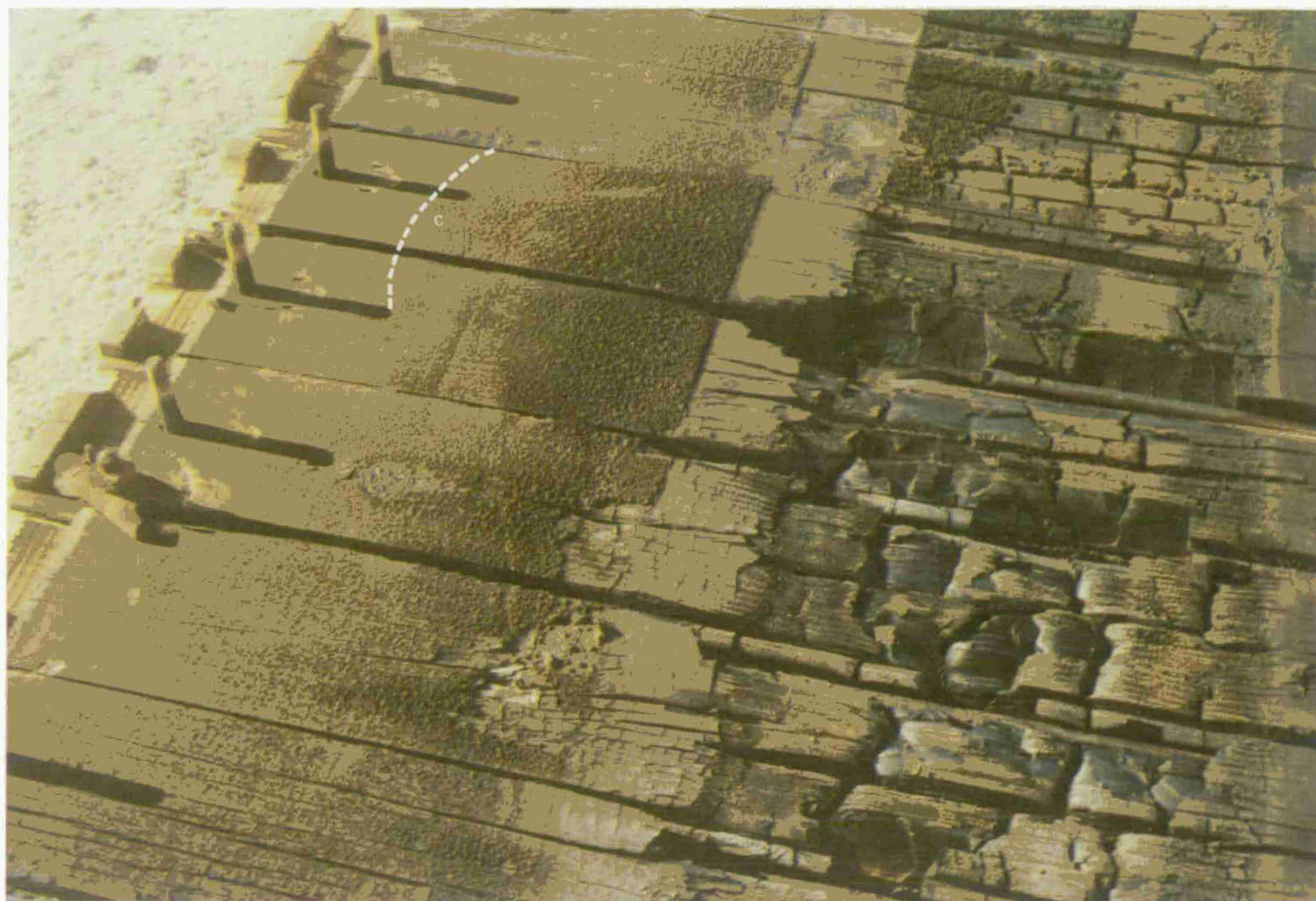


FIGURE 3A. Burn Pattern of Bottom Side of Floorboards of Experimental Boxcar.



FIGURE 4. Burn Pattern of Bottom Side of Floorboards of Reconstructed Boxcar.



FIGURE 4A. Burn Pattern of Bottom Side of Floorboards of Experimental Boxcar. The penetration crack called out here is the same one shown fully in Figure 3A.



FIGURE 5. Burn Pattern of Inside Sidewall of Reconstructed Boxcar.

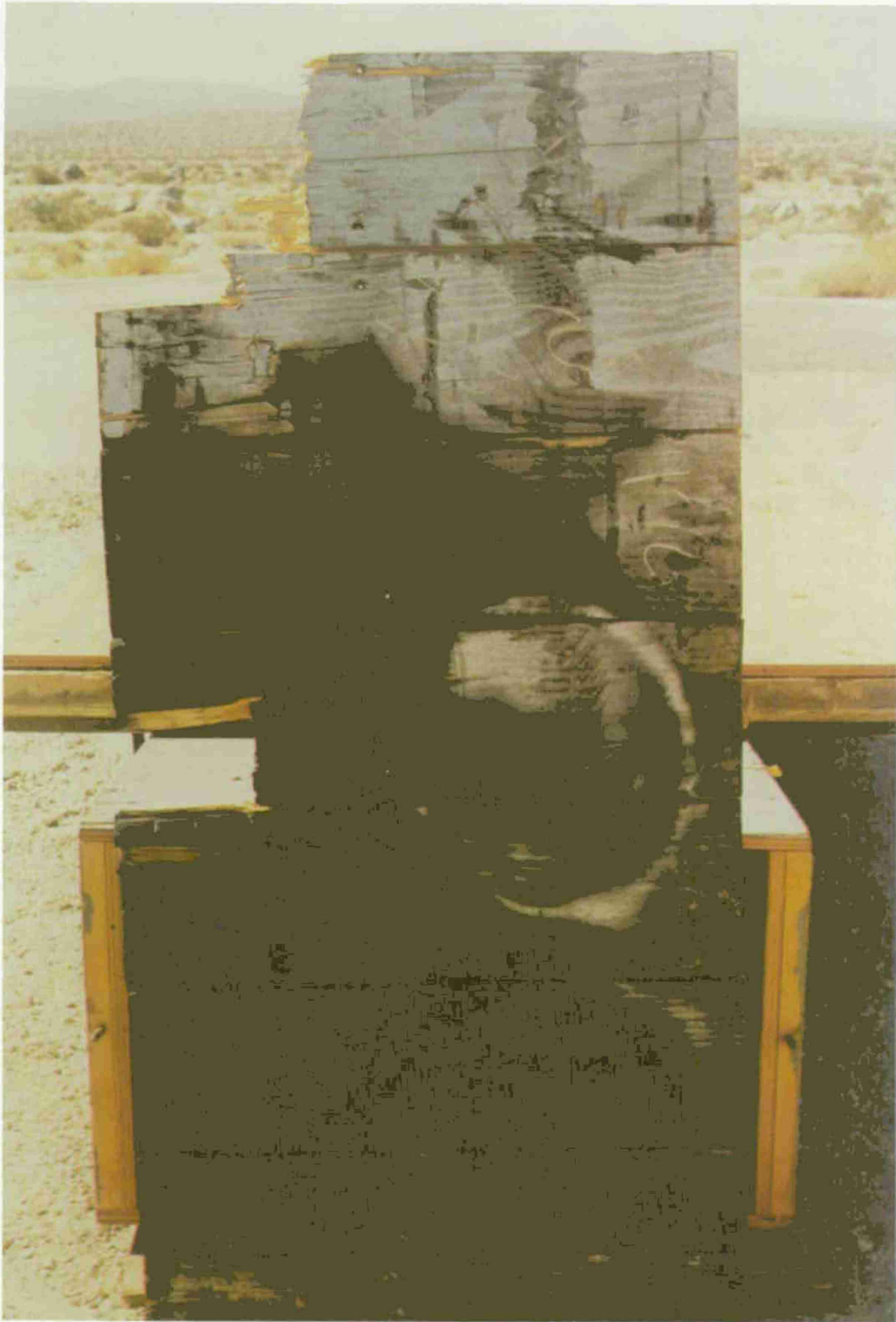


FIGURE 5A. Burn Pattern of Inside End Wall of Experimental Boxcar.

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